

## Receptacle for waste

### Field of the invention

The present invention relates to a receptacle for waste. More particularly the 5 present invention relates to a receptacle suitable for disposal of cigarette butts.

### Background of the invention

In this specification, where a document, act or item of knowledge is referred to or discussed, this reference or discussion is not an admission that the document, act or item of knowledge or any combination thereof was at the priority date:

10 (i) part of common general knowledge; or  
(ii) known to be relevant to an attempt to solve any problem with which this specification is concerned.

The discussion which follows is particularly directed to waste in the form of used cigarette butts. It will however be appreciated that the invention may be applicable 15 to other forms of refuse.

A good proportion of the population smoke cigarettes. The cigarette filter and the small amount of unburnt tobacco that remains after the bulk of the tobacco has been smoked (the "cigarette butt") is not easily bio-degradable.

Unfortunately, large numbers of cigarette butts are disposed of in an irresponsible 20 fashion. In many cases the butts are tossed onto the ground or thrown away, or are simply stamped into the ground, with no regard for the litter problem that is created.

Many butts find their way into gutters and drains and are carried by the stormwater system into surrounding waterways such as a bay or ocean. Once in the waterway cigarette butts present a significant environmental hazard and have even been 25 suggested as a cause for the reduction in numbers of certain sensitive marine species.

The litter problem associated with cigarette butts seems to be particularly acute in places where smokers congregate together. This has been exacerbated more recently by an increase in the incidence of outdoor smoking in front of office buildings and other worksites as smoking indoors is progressively prohibited. This is often accompanied by 30 an absence, or an insufficient number, of conveniently located receptacles for the butts, leading to unwanted butt disposal behaviour.

Disposal facilities for cigarette butts in public areas have generally taken the form of an ashtray that forms part of a larger waste receptacle which is generally provided by a local Council. The waste receptacles are relatively large and costly and are so are generally concentrated only in busy urban areas. Because of this a smoker will tend to 5 dispose of a cigarette butt irresponsibly rather than taking the time to find a disposal facility.

Another problem with current disposal facilities is that the frequency of emptying is timed to coincide with filling of the waste receptacle rather than the ashtray. This means that the ashtray has often overflowed by the time the receptacle is due to be 10 emptied, making the ashtray less likely to be used.

Other facilities for the disposal of cigarette butts in public areas are described in published patent specifications JP 11292201, JP 9206059 and SU 1830040. These suffer from the deficiency that they can only be cleaned by manually removing and emptying the vessel into which the cigarette butts have been placed.

15 It would therefore be advantageous to improve upon current disposal facilities for cigarette butts and in particular those in public areas, to possibly reduce the impact of pollution attributable to cigarette butts.

### **Summary of the invention**

According to a first aspect of the present invention there is provided a receptacle 20 for waste, the receptacle including an elongated body member having a first end for locating on or in the ground and a second end with an opening therein for receipt of waste, the second end including a throat of reduced dimension to that of the body member.

As understood by those skilled in the art, in a phenomena known as a venturi 25 effect, fluid increases in velocity as it passes through a constriction in a channel, pipe or duct. The inventor has found that a venturi effect created in a receptacle by the throat unexpectedly assists in drawing waste out of the receptacle by suction means.

Typically the elongated body member will be cylindrically shaped, although other shapes are envisaged within the scope of the present invention.

30 Typically the waste to be received in the receptacle will be a cigarette butt.

The present invention provides in a second aspect a receptacle for waste, the receptacle including an elongated body member having a first end for locating on or in the ground and a second end with an opening therein for receipt of waste, the body

member further including inlet means to permit atmospheric air to be drawn into the body member on the application of a vacuum to the body member, wherein contents of the receptacle are capable of being drawn from the receptacle on the application of a vacuum to the body member by entraining with atmospheric air drawn into the body member by the vacuum.

In this embodiment the beneficial venturi effect is enhanced by drawing in atmospheric air to assist the vacuum emptying of the receptacle, rather than merely relying on air already present in the receptacle.

The present invention provides in another aspect a receptacle for waste, the receptacle including an elongated body member having a first end for locating on or in the ground and a second end with an opening therein for receipt of waste, the body member having a first chamber and a second chamber in fluid communication with the first chamber, the second chamber in fluid communication with the interior of the receptacle, the first chamber having inlet means to permit atmospheric air to be drawn into the first chamber on the application of a vacuum to the body member, and the second chamber having inlet means to permit atmospheric air from the first chamber to be drawn into the second chamber on the application of a vacuum to the body member, wherein contents of the receptacle are capable of being drawn from the receptacle on the application of a vacuum to the body member by entraining with atmospheric air drawn through the chambers into the receptacle by the vacuum.

In this embodiment, the beneficial venturi effect is produced by the air moving from the first into the second chamber.

The present invention provides in another aspect a receptacle for waste, the receptacle including:

(a) a body member having a first end for locating on or in the ground and a second end with an opening therein for receipt of waste;

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- (b) inlet means in the body member through which air from the atmosphere can be drawn in response to a vacuum applied at the opening; and
- (c) air velocity increasing means for increasing the velocity of the air once inside the body member to assist in drawing waste contained in the receptacle out through the opening.

The present invention provides in another aspect a method for emptying waste from a tubular-shaped waste receptacle having a mouth and inlet means to permit atmospheric air to be drawn into the receptacle, the method including the steps of:

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- (a) applying a vacuum to the mouth of the receptacle to cause air from the atmosphere to enter the receptacle through the inlet means; and
- (b) increasing the velocity of the air once inside the receptacle to assist in drawing waste contained in the receptacle out through the mouth of the receptacle.

15 One significant advantage of the design of the present invention is that it can take the form of an unobtrusive strategically placed street post or pole, or it can simply replace an existing street post or pole, with appropriate directions for smokers to identify the receptacle and instructions on how to use it. Other receptacle configurations are envisaged within the scope of the invention, including bollards and all manner of supports used in public places such as railway stations and sporting venues.

20 It is intended that receptacles according to the invention are emptied using a fluid or a mixture of fluids. The fluid may be a liquid or a gas. Typically the fluid is atmospheric air that is drawn into the receptacle by a vacuum, however other arrangements such as where pressurised air and/or water is injected into the receptacle and then drawn by vacuum out of the receptacle with entrained waste are possible. The 25 fluid may include a deodorising liquid or gas to assist in reducing, minimising or eliminating odour.

30 In addition to giving rise to a venturi effect as noted above, the throat of the receptacle is also thought to provide an environment within the receptacle which promotes the creation of a vortex in the receptacle to facilitate rapid emptying of the receptacle during an emptying operation.

The creation of a vortex may also be promoted by directing the stream of pressurised air and/or water at an angle to the longitudinal axis of the substantially cylindrical body member so that a circular motion can be imparted to the fluid injected into the receptacle and a helical flow pattern for the receptacle contents can be adopted.

The throat of the receptacle may be provided as part of a removable insert for the receptacle. Accordingly the receptacle may be a two-component device comprising a substantially cylindrical body member and a removable insert removably attached to the body member.

5 An insert as described herein may in one embodiment be used to retrofit an existing tubular pole or post so as to convert it to a receptacle in accordance with the invention.

The receptacle may include at least one rotatable flap located within the body of the cylindrical body member.

10 The flap may be mounted in the receptacle in a plane which is substantially parallel to the longitudinal axis of the body member. Alternatively the flap may be mounted to a wall of the body member.

15 In normal day-to-day operation the flap is intended to adopt a downward orientation so that its leading edge is closer to the base of the cylindrical body member than is its trailing edge. The flap is preferably mounted such that it is freely rotatable about its mounting, so that in a receptacle emptying operation when the vortex is created within the body member to expel the contents of the receptacle, the flap can temporarily rotate about its mounting and point in a direction so that its leading edge is closer to the throat of the body member than is its trailing edge. When the emptying operation is 20 completed, by virtue of its ability to rotate, the flap is able to return to its normal day-to-day operational downward orientation.

25 In one typical embodiment the mounting for a flap comprises a rod that extends in a direction substantially perpendicular to the longitudinal axis of the member and each end of which is located in opposed recesses in the wall of the cylindrical body member, the flap capable of pivoting about the rod in response to an upward force such as the creation of a vortex within the receptacle.

30 In another typical embodiment the mounting for a flap comprises a projection from the inner wall of the cylindrical body member, the projection providing sufficient spacing from the wall to enable the flap when attached to the projection to rotate about a mounting axis as required.

The leading edge of the flap may be provided with biasing means to bias the flap in a downward direction during normal day-to-day operation. The biasing means may take any suitable form, but is preferably a weight.

The flap may comprise a pair of wings rotatable about a common axis.

If a plurality of flaps is provided within the receptacle, the flaps are preferably disposed vertically with respect to one another.

The flap of the receptacle may be provided as part of a removable insert for the receptacle. Accordingly the receptacle may be a two-component device comprising a substantially cylindrical body member and a removable insert removably attached to the body member and incorporating at least one flap.

The flap is thought to perform a number of functions. For example, it can act as a baffle during a receptacle emptying operation, the baffle promoting the creation and/or maintenance of a vortex within the receptacle. The presence of a flap can also help to deter the insertion of foreign objects into the receptacle and can thus prevent or reduce the likelihood of the receptacle being rendered inoperable.

The cylindrical body member will typically in use be provided with a liquid which is enclosed in the base of the body member and into which the cigarette butts fall following their placement inside the receptacle.

The cylindrical body member may be provided with a taper. The taper may be such that the diameter of the member nearer the first end is greater than the diameter of the member nearer the second end such that the angular velocity of the vortex created in the receptacle in an emptying operation increases as it moves towards the opening in the second end. Advantageously, the diameter nearer the first end does not exceed about 150 mm and the diameter near the second end does not exceed about 100 mm.

A receptacle according to the invention is preferably substantially permanently fixed to the ground when in situ. The receptacle may be secured to the ground by any convenient means, such as by setting the base of the receptacle in a concrete footing, or by the provision of a flange at the base of the receptacle which is bolted to a mounting on the ground.

The invention also provides a method for reinstating the integrity of a waste receptacle, the method including the steps of injecting a fluid into a receptacle as described herein in such a manner that a vortex or helical flow pattern is created within the receptacle, and applying a vacuum to the receptacle to facilitate rapid emptying of contents of the receptacle.

The method may further include the step of introducing a deodorising fluid into the receptacle simultaneously with or shortly after the initial fluid injection.

The waste receptacle and method of the present invention are thought to provide several advantages over the prior art. Principally, the waste receptacle is simpler and

cheaper to manufacture than a combined waste bin/ashtray of the prior art, meaning that more receptacles can be provided. For example, a waste receptacle in accordance with the invention could be placed every 10 metres or so in heavily populated areas.

The compact, elongated shape of preferred embodiments of the present invention also means that it can be provided in less accessible locations than prior art waste receptacles, such as jetties.

The method of emptying the receptacle is thought to provide a significant improvement over manual emptying, allowing the receptacles to be frequently emptied to prevent overflow.

#### 10 **Brief description of the drawings**

Several embodiments of the invention will now be described with reference to the following drawings wherein:

Figure 1 is a side plan view of a receptacle illustrating a first means of securing the receptacle to the ground;

15 Figure 2 is a side plan view of a receptacle illustrating a second means of securing the receptacle to the ground;

Figure 3 is a close up view of the first end of the receptacle illustrated in Figure 2;

Figure 4 is a vertical cross sectional view through the line A-A of Figure 2 illustrating the cap member fitted to the body member;

20 Figure 4A is a side plan view of the cap member illustrated in Figure 4;

Figures 5 and 5A are respectively side and perspective views of an alternative embodiment of a cap member.

Figure 6 is side plan view of the second end of a receptacle illustrating the position of the flap in the absence of the vortex;

25 Figure 7 is a perspective view illustrating the position of the flaps when the vortex is applied;

Figures 8 and 9 are plan view of an alternative embodiment of the flap arrangement;

30 Figure 10 illustrates waste receptacles in accordance with the invention having external aesthetic features applied thereto;

Figures 11 and 12 are plan views of a second embodiment of a waste receptacle in accordance with the present invention; and

Figure 13 is a cross-sectional view along the line B-B of Figure 12.

#### Detailed description of the drawings

Turning to Figure 1 a waste receptacle 100 is illustrated. The waste receptacle comprises an elongated substantially cylindrical shaped body member 102 manufactured from any suitable material such as a stainless steel or an anodised aluminium. The waste receptacle is particularly, but not exclusively, suited for erection outdoors and so in the embodiment shown has a first end 104 secured to the ground 106. A second end 108 extends vertically upwardly from the first end 104.

As illustrated in Figures 1 to 3, the member 102 may be secured to the ground by any convenient means, such as by concrete 114 or by a flange 116 that is fixed around the first end 104 of the member. A plurality of bolts 118 extend through the flange 116 to secure the member 102 to the ground.

The member 102 is substantially hollow and has an opening 110 in the second end 108 for the receipt of cigarette butts. A liquid 112 such as water is held in the base of the member 102. The liquid acts to extinguish cigarette butts that are inserted into the receptacle and fall towards the second end 108. As described in further details below, the liquid can also functionally contribute to the process of emptying the receptacle 100.

Turning to Figures 4 and 5, a roughly cylindrical shaped cap member 103 is fitted over the second end 108 of the body member 102 (shown in dotted outline) and secured to the body member 102 by any convenient means such as bolts 105. The cap member 103 comprises a vertically disposed outer wall 111, having a top 107 projecting radially inwardly therefrom. A roughly hour glass shaped inner member 113 extends downwardly from the top 107 to sit inside the second end 108 of the body member 102. The transition between the upper portion 113A and the lower portion 113B of the inner member 113 defines a throat 109 of reduced diameter to that of the cylindrically shaped body member 102.

The cap member 103, which may be made of the same material as the body member 102, or by other material such as a suitable plastic.

An alternative embodiment of the cap member 103 is illustrated in Figures 5 and 5A where a first 119 and second rod 115 are included.

The inventor has found that a particularly suitable diameter for the body member to be around 150 mm and for the throat 109 to be around 110 mm. The reduced diameter of the throat 109 assists in the creation of a vortex which is used to empty the member. This aspect of the invention is described in further detail below.

Turning to Figures 6 and 7 a housing 121 is illustrated that in use, sits inside the cap member 103 which together form a removable insert. The rod 119 extends through the housing 121 in a direction substantially perpendicular to the longitudinal axis 111 of the body member 102. A first 120 and a second 122 flap, each having a proximal (128, 130) and a distal (124, 126) end, are pivotably coupled to the rod at their respective proximal ends (128 and 130). The distal ends 124 and 126 of the flaps are of increased weight compared to the proximal end, thereby causing the distal ends to be biased in a downwards direction towards the first end of the member 110 in normal day-to-day operation, as illustrated more clearly in Figure 6.

A stopper 132 is also coupled to the rod and is located between the proximal ends of the flaps 120, 122. The rod 119, first and second flaps and stopper 132 together form a modular unit 134 and a plurality the units (in this case 2) may be aligned within the housing to be disposed co-axially along the longitudinal axis of the body member 102 at different heights. The removable insert may be replaced when damaged, or retrofitted to an existing cylindrical shaped pole or post.

In an alternative embodiment illustrated in Figures 5 and 5A the flaps do not include the biasing means or stopper. In this embodiment the flaps are aligned substantially along the longitudinal axis of the receptacle 100 during both normal day-to-day operation and during emptying.

In use, cigarette butts 137 are received through the opening 110 and fall between the distal ends 124, 126 of the flaps 120, 122 and inside wall 131 of the member 110. The cigarette butts fall downwardly towards the second end of the member 110 and are extinguished by the liquid 112 contained therein.

The receptacle is emptied by applying through a suitably configured hose a stream of high pressure air through the upper opening 110 of the receptacle. Owing to the curved walls of the receptacle and the dynamics of the air stream, a vortex is created which causes the liquid and cigarette butts to adopt a helical flow pattern around the internal periphery of the member 102 towards the opening 110. A vacuum is applied shortly thereafter.

In response to the creation of the vortex 136 and the application of the vacuum, the flaps (120 and 122) pivoted about the rod 119 thereby lifting the distal ends 124, 126, towards the second end 108 of the member 110. The tendency of the flaps 120, 122 to align themselves along the longitudinal axis of the member 110 is prevented by stopper 132 that is disposed between the flaps. In this position the flaps 120, 122 act as a baffle for preventing the vortex 136 straying from the periphery of the member 110 into the

central area and thereby assists the exit of the liquid and cigarette butts included in the vortex, out of the opening 110.

In use, the vortex generation means (not shown) also refills the liquid in the second end of the member and injects a deodoriser into the member shortly after the 5 contents of the receptacle have been evacuated. Upon cessation of the vortex the weighted distal ends cause the flaps 120, 122 to return to the position illustrated in Figure 3.

An alternative embodiment of flaps is illustrated in Figures 8 and 9, where the flaps 120, 122, 123 are pivotally coupled to a mounting 140 that is affixed to the wall 131 10 of the cylindrical body member. Responsive to the creation of the vortex, the flaps 120, 122, 123 pivot upwardly about the mounting 140 to substantially align themselves along the longitudinal axis of the member 110.

The member 102 may have external aesthetic and functional features applied thereto, as illustrated in Figure 10.

15 An alternative embodiment of a waste receptacle in accordance with the invention is described by reference to Figures 11 to 13. In this embodiment, the receptacle 200 comprises a main body member 200, of substantially the same construction set out above and a separate dividing member 202. At its upper region 204, the dividing member 202 is substantially cylindrical and has a diameter slightly less than the diameter of the body 20 member 200. The lower region of the dividing member comprises an inwardly tapering conical portion 208 that extends from the upper region.

A cage member 205 is attached to the exterior of body member 200 by screws, for the purpose of displaying advertising or informational material on the receptacle 200. The material can be slotted into the cage member 205 and replaced as and when required.

25 When the dividing member 202 is inserted into the body member 200 (Figure 13), by simply dropping the dividing member 202 into the mouth of the body member 200, the cylindrical portion of the dividing member 202 fits tightly into the body member 200, with the conical portion 208 dividing the receptacle into a first (outer) chamber 210, formed by the outer wall of the dividing member and the inner wall of the body member, and a second (inner) chamber 211, formed by the dividing member 202.

An inlet 212 in the form of three offset rows of circumferentially spaced holes provides a fluid connection between the external atmosphere and the first chamber 210. The base of the dividing member has a series of "mousehole" shaped sections 216

removed therefrom, to provide a second fluid connection, between the outer 210 and inner 211 chambers.

As described above, it has been found useful to provide a volume of liquid, 214 such as water with a deodorising element into the receptacle 200. The liquid 214, acts to 5 not only extinguish cigarette butts placed into the receptacle, but also assists in emptying the receptacle by vacuum suction, as is now described.

To empty the receptacle, a vacuum device (not shown) makes a sealing connection to the mouth of the receptacle 218 and a suction force is applied. The suction force causes the liquid 214, along with any cigarette butts or other waste entrained therewith to 10 be drawn upwardly (arrow A) through the inner chamber 211. The suction force and the moving liquid with entrained waste also causes atmospheric air to enter the outer chamber 210 through the inlets 212 (arrow B). Once in the outer chamber 210, the suction force continues to draw the air through the mouse holes 216 and into the inner chamber 212 (arrow C).

15 When the air negotiates the constriction posed by the mouse holes 216, a venturi effect is created, causing the velocity of the air to increase as it enters the inner chamber 211. This volume of fast moving air, adds to the suction force to allow the liquid and any waste entrained therewith, to be quickly and efficiently emptied. The inventor has found that a single receptacle can be emptied using only a moderate suction force, in around 4 20 seconds.

Modifications and improvements to the invention will be readily apparent to those skilled in the art. Such modifications and improvements are intended to be within the scope of this invention.